FLASH MCU Programmer for FM0+ / FM3 / FM4
User Manual

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Software version :V01L18

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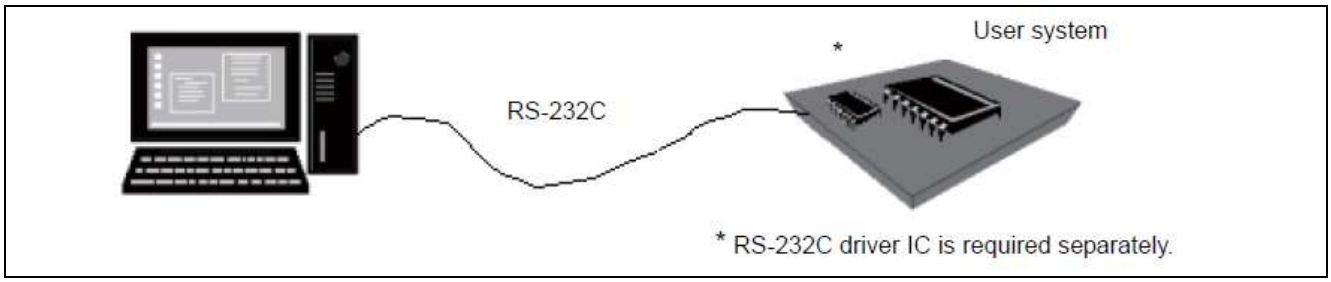
1. Configuration Diagram



Using RS-232C cable connected to the personal computer (Windows PC), flash memory data in the microcontroller mounted in the user system can be reprogrammed. Note that the user system must have an RS-232C driver for communication with the microcontroller UART.

2. Compatible Microcontrollers

FM0+:

S6E1A11B0A/C0A, S6E1A12B0A/C0A

S6E1B16E/F/G, S6E1B14E/F/G(*)

S6E1B36E/F/G, S6E1B34E/F/G(*)

S6E1B86E/F/G, S6E1B84E/F/G(*)

FM3:

MB9AF102N/R, MB9AF104N/R

MB9AF111K, MB9AF112K

MB9AF111L/M/N, MB9AF112L/M/N, MB9AF114L/M/N, MB9AF115M/N, MB9AF116M/N

MB9AF121K/L

MB9AF131K/L, MB9AF132K/L

MB9AF131M/N, MB9AF132M/N

MB9AF141L/M/N, MB9AF142L/M/N, MB9AF144L/M/N

MB9AF154M/N/R, MB9AF155M/N/R, MB9AF156M/N/R

MB9AF1A1L/M/N, MB9AF1A2L/M/N

MB9AF311K, MB9AF312K

MB9AF311L/M/N, MB9AF312L/M/N, MB9AF314L/M/N, MB9AF315M/N, MB9AF316M/N

MB9AF341L/M/N, MB9AF342L/M/N, MB9AF344L/M/N

MB9AF421K/L

MB9AFA31L/M/N, MB9AFA32L/M/N

MB9AFA41L/M/N, MB9AFA42L/M/N, MB9AFA44L/M/N

MB9AFAA1L/M/N, MB9AFAA2L/M/N

MB9AFB41L/M/N, MB9AFB42L/M/N, MB9AFB44L/M/N

MB9BF104N/R, MB9BF105N/R, MB9BF106N/R

MB9BF112N/R, MB9BF114N/R, MB9BF115N/R, MB9BF116N/R

MB9BF116S/T, MB9BF117S/T, MB9BF118S/T

MB9BF121J

MB9BF121K/L/M, MB9BF122K/L/M, MB9BF124K/L/M

MB9BF128S/T, MB9BF129S/T

MB9BF216S/T, MB9BF217S/T, MB9BF218S/T

MB9BF304N/R, MB9BF305N/R, MB9BF306N/R

MB9BF312N/R, MB9BF314N/R, MB9BF315N/R, MB9BF316N/R

MB9BF316S/T, MB9BF317S/T, MB9BF318S/T

MB9BF321K/L/M, MB9BF322K/L/M, MB9BF324K/L/M

MB9BF328S/T, MB9BF329S/T

MB9BF404N/R, MB9BF405N/R, MB9BF406N/R

MB9BF412N/R, MB9BF414N/R, MB9BF415N/R, MB9BF416N/R

MB9BF416S/T, MB9BF417S/T, MB9BF418S/T

MB9BF428S/T, MB9BF429S/T

MB9BF500N/R, MB9BF504N/R, MB9BF505N/R, MB9BF506N/R

MB9BF512N/R, MB9BF514N/R, MB9BF515N/R, MB9BF516N/R

MB9BF516S/T, MB9BF517S/T, MB9BF518S/T

MB9BF521K/L/M, MB9BF522K/L/M, MB9BF524K/L/M

MB9BF528S/T, MB9BF529S/T

MB9BF616S/T, MB9BF617S/T, MB9BF618S/T

MB9BFD16S/T, MB9BFD17S/T, MB9BFD18S/T

FM4:

S6E2CC8H0A/J0A/L0A, S6E2CC9H0A/J0A/L0A , S6E2CCAH0A/J0A/L0A

S6E2DH5G0A/J0A

MB9BF164K/L, MB9BF165K/L, MB9BF166K/L

MB9BF166M/N/R, MB9BF167M/N/R, MB9BF168M/N/R

MB9BF364K/L, MB9BF365K/L, MB9BF366K/L

MB9BF366M/N/R, MB9BF367M/N/R, MB9BF368M/N/R

MB9BF464K/L, MB9BF465K/L, MB9BF466K/L

MB9BF466M/N/R, MB9BF467M/N/R, MB9BF468M/N/R

MB9BF564K/L, MB9BF565K/L, MB9BF566K/L

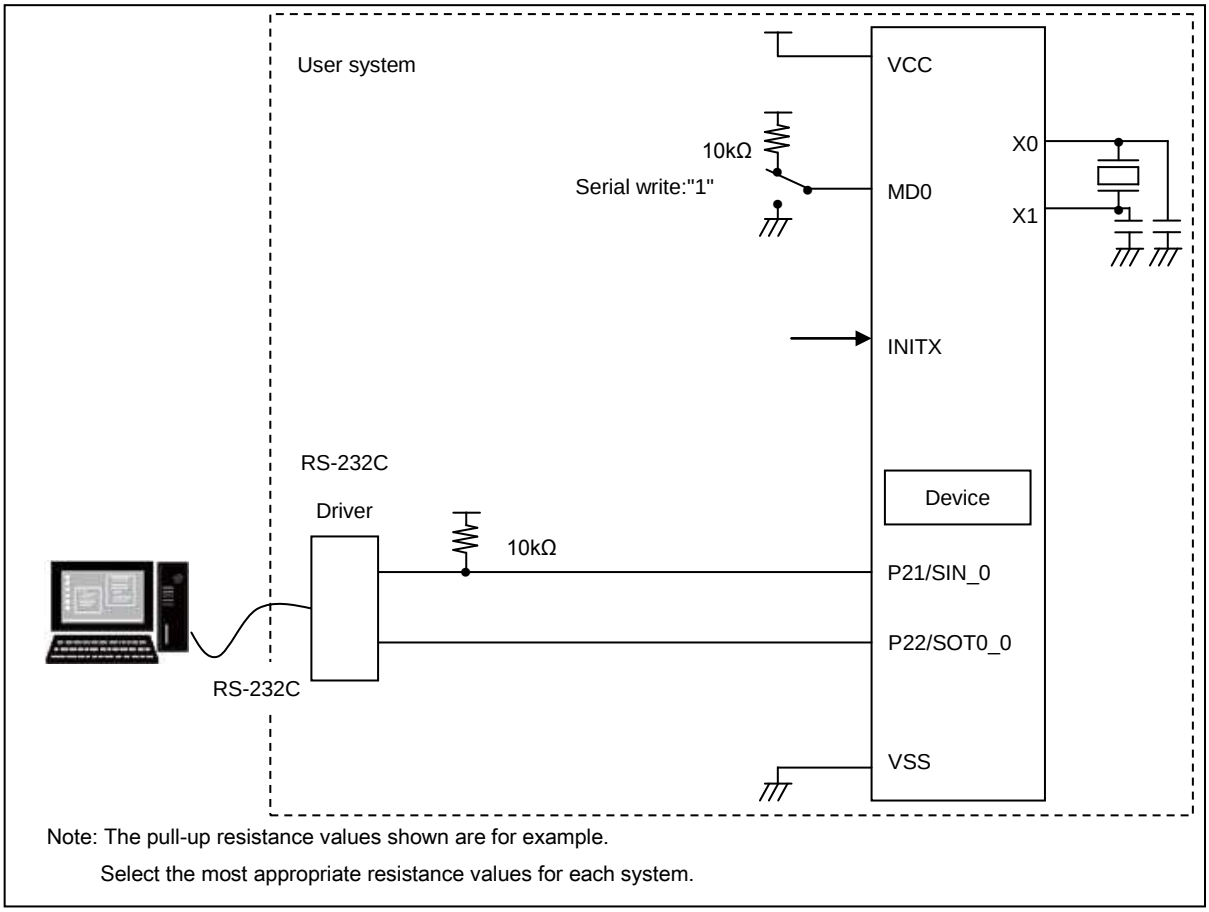
MB9BF566M/N/R, MB9BF567M/N/R, MB9BF568M/N/R

(*: New)

Note: The MCU which has suffix (A, B, etc.) as end of Product Name (“MB…”), and when it’s equivalent of the MCU which has no suffix, they are not in list.

3. Example of Connection for On-board Programming

FM0+ (Only MD0):

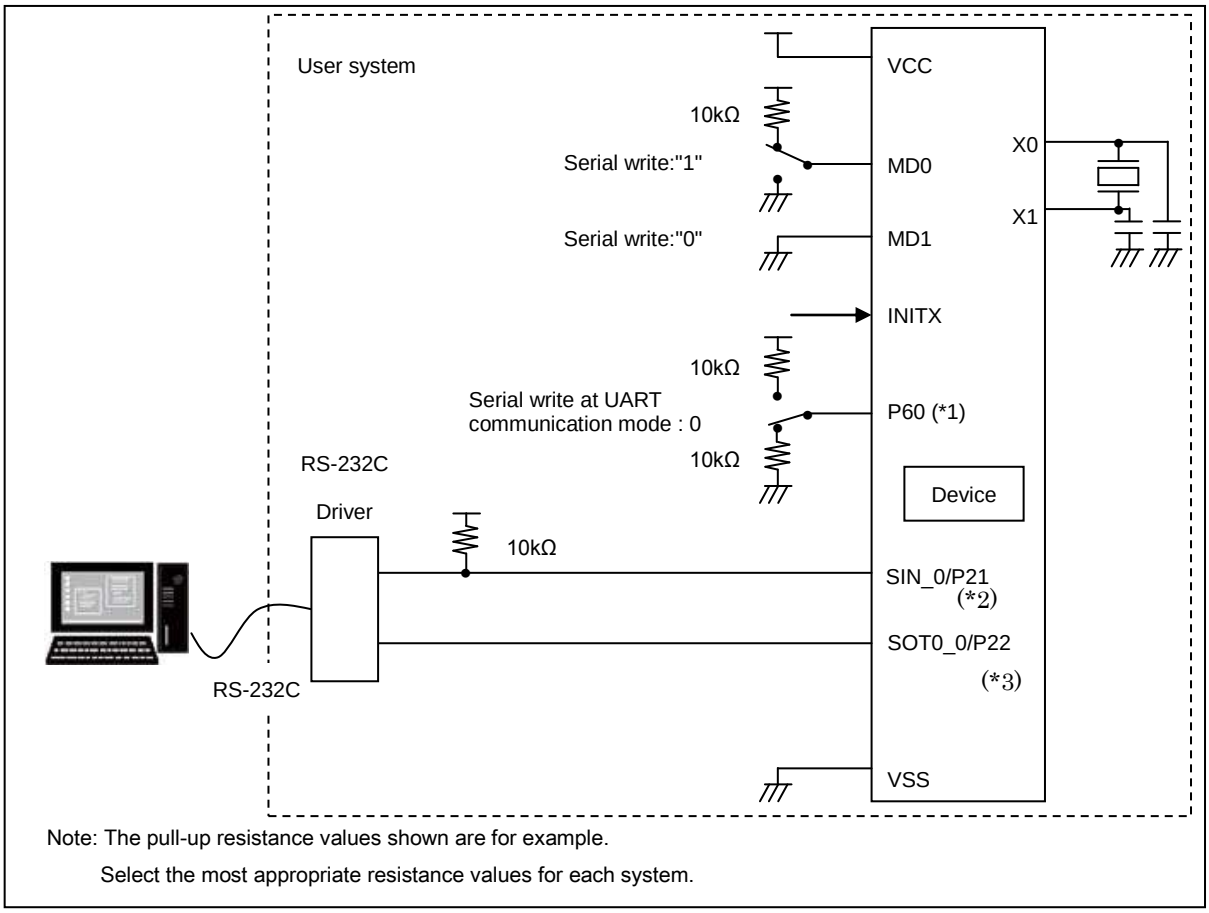


The MD0 pin cannot be controlled by the PC and should be set in the user system.

During serial reprogramming, when the INITX pin is set from “Low” to “High” level after setting the MD0 pin, the microcontroller enters the serial reprogramming mode, enabling serial reprogramming from the PC.

After the reprogramming, control is shifted to the normally-used mode as for MD0 pin. Then INITX pin set from “Low” to “High” level executes user program.

FM0+ (With MD1), FM3, FM4:



The MD1 and MD0 pins, and P60(**) pins cannot be controlled by the PC and should be set in the user system. (**: P60 is the terminal of the general-purpose port for which a setup is needed. The port number depends on the model of MCU.)

During serial reprogramming, when the INITX pin is set from “Low” to “High” level after setting the MD1 pin and MD0 pin, and P60 pin, the microcontroller enters the serial reprogramming mode, enabling serial reprogramming from the PC.

After the reprogramming, control is shifted to the normally-used mode as for MD1 and MD0 pins and to the user circuit side as for P60 pin. Then INITX pin set from “Low” to “High” level executes user program.

*1 : The following MCU need not use P60 pin to select the serial programming mode.

[MCU] MB9AF13xK/L/M/N, MB9AF1AxL/M/N,
MB9AFA3xL/M/N, MB9AFAAxL/M/N, MB9BF121J

*2,3 : The port number of SIN/SOUT of some MCU are not P21/P22.
Please see MCU’s manual.

4. Pins Used

(1) Pins used for serial programming

FM0+ (Only MD0):

Function	Pin name	Supplement
Mode pin	MD0	Performing an external reset or turning on the power after setting MD0=H enters the serial programming mode.
Reset pin	INITX	-
UART serial data pin	P21/SIN0_0	Setting the input level of this pin to "H" until the start of communication enables the UART programming mode.
UART serial data pin	P22/SOT0_0	-

FM0+ (With MD1), FM3, FM4:

Function	Pin name	Supplement
Mode pin	MD1, MD0	Performing an external reset or turning on the power after setting MD0=H and MD1=L enters the serial programming mode.
Communication mode select pin	P60 *1	Setting it to "L" enables the UART programming mode.
Reset pin	INITX	-
UART serial data pin	SIN0_0/P21*2	Setting the input level of this pin to "H" until the start of communication enables the UART programming mode.
UART serial data pin	SOT0_0/P22*3	-

*1 : The following MCU need not use P60 pin to select the serial programming mode.
[MCU] MB9AF13xK/L/M/N, MB9AF1AxL/M/N,
MB9AFA3xL/M/N, MB9AFAAxL/M/N, MB9BF121J

*2,3 : The port number of SIN/SOUT of some MCU are not P21/P22.
Please see MCU's manual.

5. Installation and Execution of Software

If there is the old version, uninstall it first before installation. Starting the installer to operate as instructed will complete the installation. Note that the install might not be performed when a directory in a deep nest is specified as the install directory.
And, if there is the software of an old version, the installer may perform only uninstallation of the old version. Please start again the installer.

After installation, click the Windows
Start button => *Program* => *FLASH MCU Programmer* => *FM0+ FM3 FM4*
to start the programmer software.

6. Programmer Functions

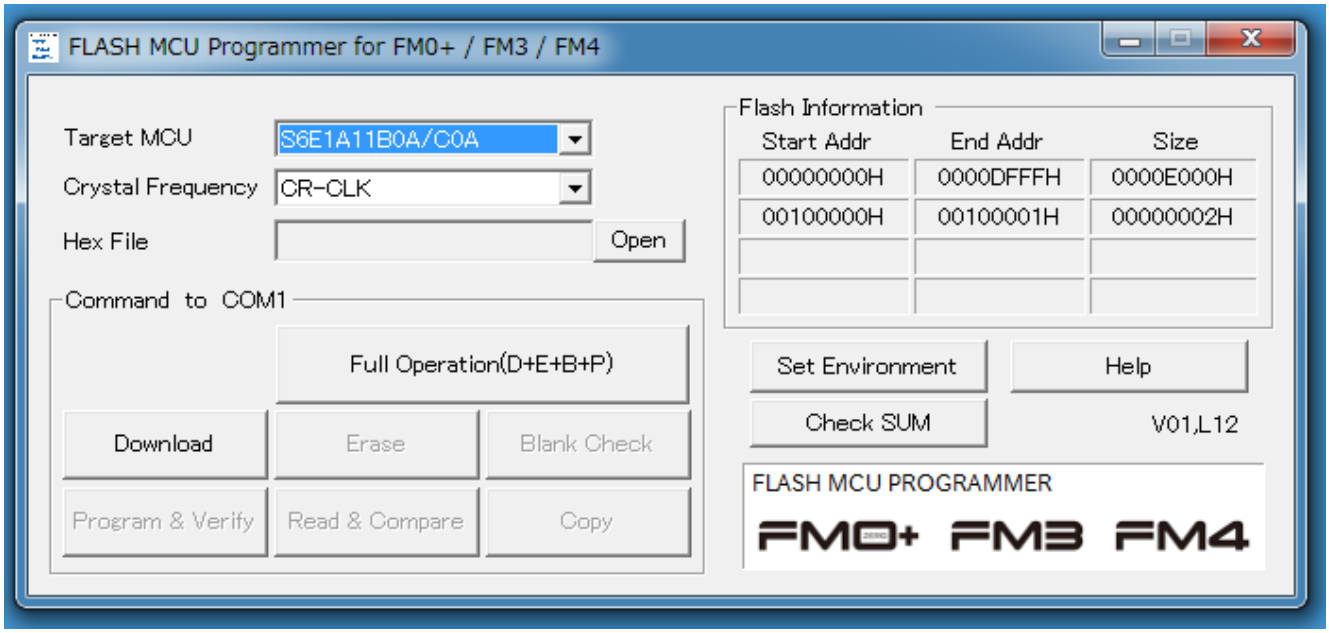
Erase, Blank Check, Program & Verify, Read & Compare, and Copy can be executed for flash memory integrated into the microcontroller.

[LIMITATION]

When the flash security function is effective, please connect the external crystal oscillator. If you use this program by the internal CR clock, for secured MCU, when you erase, communication error will occur and the trimming data will disappear.

Main dialog box

Programmer software is started to open the dialog box as shown below.



Overview of operating procedure

First, complete setting of the user system (microcontroller board) that data is programmed to (see *Chapter 3*). In starting or when setting has been changed, it is necessary to perform downloading (described later).

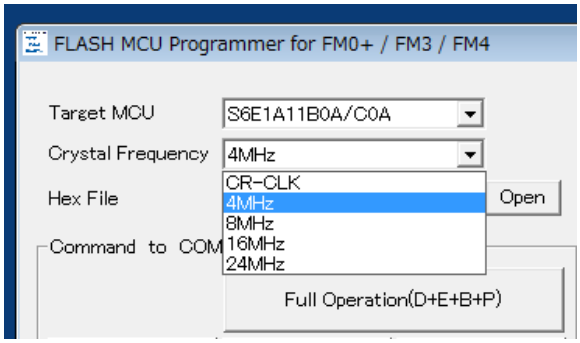
After downloading terminates normally, perform procedures such as Erase and Programming.

6-1. Downloading

This section describes the operating procedure for downloading and the operating state of the program.

(1) Specify the type of microcontroller used in the user system in *Target Microcontroller* of the main dialog box.

(2) Specify the frequency of the crystal oscillator input to the microcontroller in *Crystal Frequency* of the main dialog box.



The frequency of the crystal oscillator that can be specified for each type of microcontroller is limited. Please see [6-1-1. Frequency List].

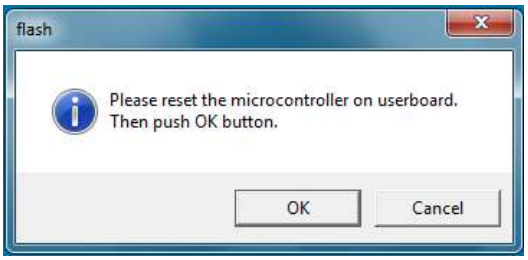
(3) Select the COM port of the PC connected to the user system.

Click the *[Set Environment]* button in the main dialog box to open the setup window. When the *[COM PORT]* tab in the setup window is clicked, the specifying window is opened.

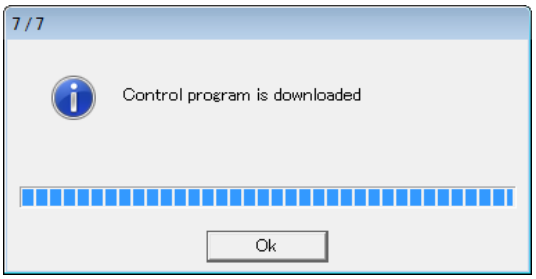
(4) Execution of downloading

Click the *[Download]* button.

If the following dialog window is opened, Input a reset signal to the microcontroller to start the program in the flash programming mode and then click the *[OK]* button



Downloading is performed to open the “Download” window. When downloading is completed normally, the following dialog window opens.



When the *[OK]* button is clicked to close the dialog window, the *[Erase]*, *[Blank Check]*, *[Program & Verify]*, *[Read & Compare]* and *[Copy]* buttons are enabled.

6-1-1. Frequency List

Notice: This program will not operate normally if the microcontroller uses a crystal oscillator frequency not listed in the table. Don't connect a crystal oscillator with the main clock pin of target microcontroller when the "CR clock" is selected.

FM0+:

Target Microcontroller	Crystal Frequency (MHz)
S6E1B14E/F/G, S6E1B16E/F/G S6E1B34E/F/G, S6E1B36E/F/G S6E1B84E/F/G, S6E1B86E/F/G	CR Clock, 4,8,16,24
S6E1A11B0A / S6E1A11C0A, S6E1A12B0A / S6E1A12C0A	CR Clock, 4,8,16,24

FM3:

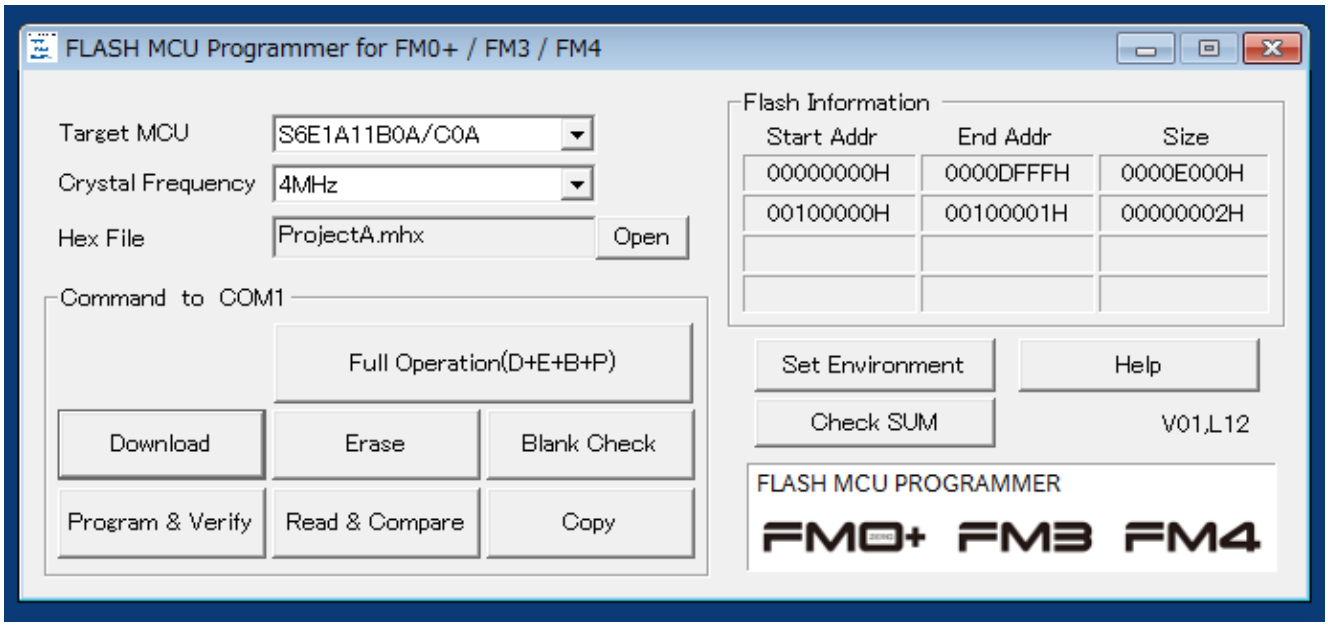
Target Microcontroller	Crystal Frequency (MHz)
MB9AF10xN/R	4,8,16,24
MB9AF11xM/N, MB9AF11xL/M/N, MB9AF31xM/N, MB9AF31xL/M/N	4,8,16,24
MB9AF11xK, MB9AF31xK	CR Clock, 4,8,16,24
MB9AF121K/L, MB9AF421K/L	CR Clock, 4,8,16,24
MB9AF13xK/L	CR Clock, 4,8,16
MB9AF13xM/N, MB9AFA3xL/M/N, MB9AF1AxL/M/N, MB9AFAAxL/M/N	CR Clock, 4,8,16
MB9AF14xL/M/N, MB9AF34xL/M/N, MB9AFA4xL/M/N, MB9AFB4xL/M/N	CR Clock, 4,8,16,24
MB9AF15xM/N/R	CR Clock, 4,8,16,24
MB9BF10xN/R, MB9BF30xN/R, MB9BF40xN/R, MB9BF50xN/R	4,8,16,24,48
MB9BF11xN/R, MB9BF31xN/R, MB9BF41xN/R, MB9BF51xN/R	4,8,16,24,48
MB9BF11xS/T, MB9BF21xS/T, MB9BF31xS/T, MB9BF41xS/T, MB9BF51xS/T, MB9BF61xS/T, MB9BFD1xS/T	4,8,16,24,48
MB9BF12xK/L/M, MB9BF32xK/L/M, MB9BF52xK/L/M	CR Clock, 4,8,16,24
MB9BF12xS/T, MB9BF32xS/T, MB9BF42xS/T, MB9BF52xS/T	CR Clock, 4,8,16,24
MB9BF121J	CR Clock, 4,8,16,24

FM4:

Target Microcontroller	Crystal Frequency (MHz)
S6E2DH5G0A/J0A	CR Clock, 4,8,16
S6E2CC8H0A/J0A/L0A, S6E2CC9H0A/J0A/L0A, S6E2CCAH0A/J0A/L0A	CR Clock, 4,8,16,24,48
MB9BF16xK/L, MB9BF36xK/L, MB9BF46xK/L, MB9BF56xK/L	CR Clock, 4,8,16,24,48
MB9BF16xM/N/R, MB9BF36xM/N/R, MB9BF46xM/N/R, MB9BF56xM/N/R	CR Clock, 4,8,16,24,48

6-2. Erasing and Programming

This section explains how to specify *Hex File* and the processing and operation performed when the *[Erase]*, *[Blank Check]*, *[Program & Verify]*, *[Read & Compare]*, *[Copy]* and *[Full Operation (D+E+B+P)]* buttons are clicked.



[LIMITATION]

When the flash security function is effective, please connect the external crystal oscillator.

If you use this program by the internal CR clock, for secured MCU, when you erase, communication error will occur and the trimming data will disappear.

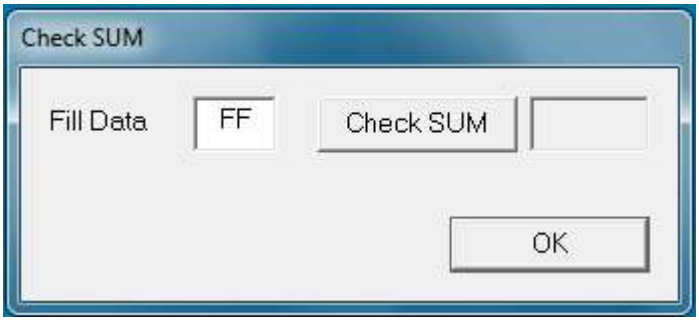
(a) *Hex File*: Select the file to be programmed to flash memory

Specify the Motorola-S or Intel-HEX format file to be programmed to flash memory in the microcontroller. Although the specification method by drags and drops a direct file from Explorer etc. is recommended, it can specify also by the file appointed window displayed by pushing the *[Open]* button.

Hex File must be specified to execute *[Program & Verify]*, *[Read & Compare]* and *[Full Operation (D+E+B+P)]*. Since it is decoded at the head of these processings each time, even if the specified Motorola-S or Intel-HEX format file changes specification of a file just before processing, it is OK.

After Hex File is specified, checksum to ROM image after Motorola-S format file or Intel-HEX format file shown in Hex File is deciphering done can be calculated.

The dialog box to calculate checksum when a lower right *[Check SUM]* button is pushed opens.



The range of the calculation of checksum is limited to the Flash area shown in the upper right of the main dialog. When the area has divided into plural block, the empty area between blocks is not added, and the total of each block is calculated.

The calculation method is simple addition of every one byte, and the result shows the last 4 digits (It is not a complement representation) by the hexadecimal number.

ROM value in the Flash area not shown in Hex File is calculated assuming that it is a value indicated by Fill Data at the left of the dialog. When starting, FF is set here. Please specify it by two hexadecimal number digits when changing.

[Notes concerning checksum]

This function doesn't calculate the checksum of ROM image written in the FLASH memory in the microcontroller chip. When Hex File is not specified, and the error is detected at the decipherment of Hex File, nothing is displayed.

The SUM value calculated here is not peculiar against Hex File. When another microcontroller is selected, same Hex File might reach another value.

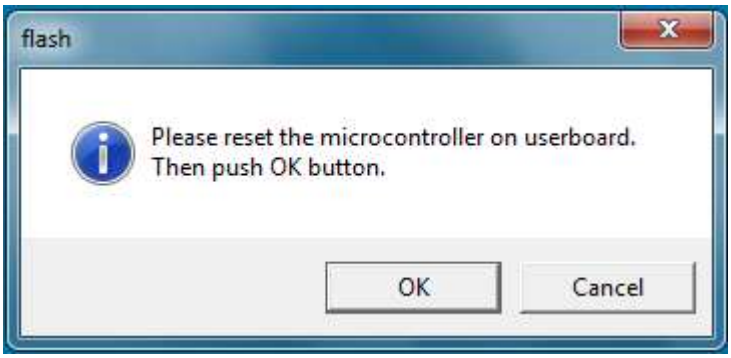
The value specified with Fill Data is not written at the time of writing. This value is used only for the calculation of checksum.

(b) ***Erase***: Erase all flash memory areas

All flash memory must be in the blank state (0xff) when programming a new program to it. By pushing this button, a chip erase command is published to FLASH and elimination is performed.

When the flash memory is protected, the following windows might be displayed while executing the Erase command. If the following dialog window is opened, Input a reset signal to the microcontroller to start the program in the flash programming mode and then click the *[OK]* button.

In addition, a blank check does not perform this command.



(c) ***Blank Check***: Check that all flash memory areas are blank

This button is clicked to check that all flash memory is in the blank state (0xff).

(d) ***Program & Verify***: Program data to flash memory

This button is clicked to program the Motorola-S or Intel-HEX format file specified in ***Hex File*** to flash memory in the microcontroller concurrently with verification. An error dialog is displayed, when writing is performed for 512 bytes of every block and a CRC error is detected by the block.

This dialog If YES is pushed, the block of an error will be resent and it will continue writing. A push on NO interrupts write-in processing.

(e) *Read & Compare*: Compare *Hex File* with data in flash memory in microcontroller

This button is clicked to compare data in the Motorola-S or Intel-HEX format file specified in *Hex File* with data in flash memory in the microcontroller. Like the *[Program & Verify]* processing, The data of FLASH is transmitted for 512 bytes of every block, a CRC error check is performed, and comparison processing is performed.

(f) *Copy*: Save data in flash memory in microcontroller to file

This button is clicked to read data from flash memory integrated into the microcontroller and save it as an Motorola-S or Intel-HEX format file. Like *[Read & Compare]* processing, FLASH memory reading is performed for 512 bytes of every block, and a CRC error check is performed similarly.

The output file format can be changed by right-clicking in the Copy button. The button name changes by *[Copy]* and *[Copy_i]* whenever right-clicking. The state of *[Copy]* shows Motorola-S format, and the state of *[Copy_i]* shows Intel-HEX format.

Processing begins when the button is left-clicked, the folder is specified preservation ahead, the file name is input, and the *[Save]* button is pushed when the form is selected.

(g) *Full Operation (D+E+B+P)*: Automatic programming

Operation to *[Download]* to *[Program & Verify]* is performed by package.

In the case of a blank chip, processing is performed in order of *[Download]*, *[Blankcheck]*, and *[Program & Verify]*. When it is not a blank chip, processing is performed in order of *[Download]*, *[Blankcheck]*, *[Erase]*, *[Blankcheck]*, and *[Program & Verify]*.

6-3. Motorola-S format decoder specification

Before programming, Motorola-S format Decoder of programmer changes Motorola S format data into binary data, according to the following specification.

(a) The decoder does not error when overlap of addresses occurs.

The decoder does not error about overlap of address. If user writes a data on an address which was already written another data before, former data is overwritten by new data.

(b) Available address

If user writes a data beyond an address range of FLASH memory, programming results in an error.

(c) About the error detected by the decoder.

The error detected by the decoder is the following (1)-(4). When these errors are detected, processing is interrupted by the decoder. Then the line number and the cause of the error are displayed in the dialog window.

(1) file error

The start of the line is not "S".

(2) S-format error

The start of the line is not "S0","S1","S2","S3","S5","S7","S8" and "S9".

(3) decode error

- There are character except "0123456789ABCDEF".("S" is excluded. See (1) and (2).) And, the small letter "abcdef" cannot be used.
- The LENGTH data is different from the length of an actual data row.
- The SUM data is different.

(4) address error

There is data besides the FLASH area. (See b.Available address)

(d) Other detail

The decoder skips a line. even if the line is contained only new-line code NL and programming goes on.

A line beginning with "S0","S5","S7","S8" and "S9" is ignored and decoder skips such lines in S format file without error.

6-4. Intel-Hex format decoder specification

Before programming, Intel-Hex format Decoder of programmer changes Intel-Hex format data into binary data, according to the following specification.

(a) The decoder does not error when overlap of addresses occurs.

The decoder does not error about overlap of address. If user writes a data on an address which was already written another data before, former data is overwritten by new data.

(b) Available address

If user writes a data beyond an address range of FLASH memory, programming results in an error.

(c) About the error detected by the decoder.

The error detected by the decoder is the following (1)-(4). When these errors are detected, processing is interrupted by the decoder. Then the line number and the cause of the error are displayed in the dialog window.

(1) file error

The start of the line is not ":".

(2) decode error

There are character except "0123456789ABCDEF".(":" is excluded. See (1).) And, the small letter "abcdef" cannot be used.

The record type is not 00, 01, 02, 03, 04, and 05.

The length of the data string that turns out by the number of data is different from the length of an actual data string.

The SUM data is different.

(3) record error

When not is in number 0 of data at 01 records.

When not is in number 2 of data at 02 records.

When not is in number 4 of data at 03 records.

When not is in number 2 of data at 04 records.

When not is in number 4 of data at 05 records.

(4) address error

There is data besides the FLASH area. (See b.Available address)

7. Operating environment

Required equipment :

- Windows PC with the RS-232C port
- RS-232C cable (commercial item)

OS :

- Windows XP / Windows Vista(32bit) / Windows 7(32bit/64bit) / Windows 8.1(32bit/64bit)

* There is fault that some characters are not displayed correctly, in Windows Vista. However, we are checking that the program is performing normal operation.

Memory size :

- More than the memory quantity that OS recommends

Hard disk :

- (Availability) Not less than 10 MB

NOTICE : The operations of all models that meet the above conditions may not be ensured.

8. Others

(A) Setting of voice output

The setting of voice generated when an error occurs and processing is terminated normally can be changed.

Select the *[Sound]* tab in the setup window that opens when the *[Set Environment]* button is clicked.

To output sound, put a check in the *Enable sound* checkbox.

Check the status of sound output. Select *ERROR* or *END* in the sound column.

Select *Wave* or *Beep* as the type of sound to be output in *Sound type*.

Set the voice file to be output in the *Wave* file column only when *Wave* is selected. When the *[Open]* button is clicked, the File Open window is opened. Select the *Wave* file to be output. The *[Play]* button is used to play the set *Wave* file. The *[Stop]* button is used to stop the *Wave* file.

(B) Setting of tooltips display

The tooltips display can be “enabled” or “disabled”.

Select the *[Tooltips]* tab in the setup window that opens when the *[Set Environment]* button is clicked.

When a checkmark is put in the *tooltips* checkbox to move the mouse cursor over the contents such as buttons in the dialog window, simple help (the full path of a file for Hex File) is displayed.

(C) Error messages

Many error messages are displayed owing to the setting mistake of hardware and software. the case where an error is outputted in addition even if it checks these in detail, please tell the person in charge of software acquisition origin a detailed condition.

No.	Item	Description
No.001	Message	Download error *1
	Cause	The response of download processing is unusual.
	Action	Please check connection and a setup of hardware.
No.003	Message	Timeout error
	Cause	The response of a command does not come on the contrary.
	Action	Please check connection and a setup of hardware.
No.006	Message	Unable to open COM port
	Cause	Another application is using COM.
	Action	Please check the use situation and port number of a COM port.
No.007	Message	Unable to open Download file
	Cause	**m_flash.xxx** not found
	Action	Please reinstall this software.
No.009	Message	Unable to gain COM port info
	Cause	It will be in the state where the target COM port can be used.
	Action	Please check the number of a COM port and setup to be used.
No.010	Message	Unable to change COM port setting
	Cause	A communication setup cannot be set as the target COM port.
	Action	Please inform support of condition.
No.011	Message	Communication error
	Cause	The unusual command response was received.
	Action	Please reperform by improving connection and a setup of hardware.
No.012	Message	Read error
	Cause	The response at the time of read&compare or copy processing is unusual.
	Action	Please reperform by improving connection and a setup of hardware.
No.013	Message	Program error
	Cause	The response at the time of Program&Verify processing is unusual.
	Action	Please reperform by checking whether a chip is blank.
No.015	Message	COM port write error
	Cause	There is the possibility of the abnormalities of a COM port driver or the port itself.
	Action	Please inform support of condition.

No.	Item	Description
No.016	Message	COM port read error
	Cause	There is the possibility of the abnormalities of a COM port driver or the port itself.
	Action	Please inform support of condition.
No.017	Message	File access error
	Cause	Access of a **m_flash.xxx** file went wrong.
	Action	Return the folder and file configurations to the installation defaults.
No.018	Message	Erase error *1
	Cause	The response at the time of erase processing is unusual. There is the possibility that a chip is poor.
	Action	Please improve a setup of hardware or exchange chips.
No.019	Message	Unable to open KEY file
	Cause	Key file can not open.
	Action	Please create and set up right key file.
No.101	Message	Please set "hex file"
	Cause	“Hex file” not set
	Action	Set “hex file” in the dialog box.
No.105	Message	key length too short
	Cause	The minimum conditions for key length are not met.
	Action	Prepare a correct security file.
No.106	Message	key length too long
	Cause	The maximum conditions for key length are not met.
	Action	Prepare a correct security file.
No.107	Message	Illegal security file
	Cause	The security file description is invalid.
	Action	Prepare a correct security file.
No.207	Message	memory is not available
	Cause	Unable to allocate memory for execution
	Action	Quit any running application and retry.
*2	Message	Please redo from download operation.

*1: “MCU xxH” is displayed if the error cause is returned from the microcontroller at a download error.

“MCU xxH” means:

MCU 02H → SUM error at downloading

MCU 04H → Abnormal termination at downloading

*2: This is an additional message. It is displayed as necessary after other messages are displayed.

9. Cautions

The PC programming software has the possibility of receiving the influence by the communications cable, the outside environment, and the PC.
Therefore, please evaluate it enough when you use the software.
Please use programming systems of programmer venders when you write two or more devices at the same time.
The specifications of the product are subject to change without notice.